Attorney Docket No. 49,946 (71699)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT	Ray F. Lee	EXAMINER:	Vargas, Dixomara
U.S.S.N.:	09/822,771	GROUP:	2859
FILED:	March 30, 2001	Conf. No.	6965
FOR:	APPARATUS FOR MAGNETIC RESONANCE IMAGING HAVING A PLANAR STRIP ARRAY ANTENNA INCLUDING SYSTEMS AND METHODS RELATED THERETO		

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CERTIFICATE OF MAILING

I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on February 4, 2004.

By: Helen Murray Tarbi
Helen Murray Tarbi

DECLARATION OF RAY F. LEE UNDER RULE 132

Sir:

I, Ray F. Lee, declare as follows:

1. I am the sole inventor of the subject matter described and claimed in the patent application U.S.S.N. 09/822,771, filed on March 30, 2001 and otherwise identified above.

2. I have read the Final Office Action mailed August 4, 2003, including the grounds or remarks provided by the Examiner as to why Claims 1-7 and 9-54 were considered unpatentable over the cited art.

3. This declaration is being submitted to address certain conclusions reached by the Examiner as to the teachings and disclosure of the principal and secondary references cited in support of the rejection of the claims.

4. The Office Action asserts that Foo discloses a device for detecting field electromagnetic signals, comprising a strip array antenna, wherein the strip array antenna includes a plurality of conductors arranged so as long axis of each is in parallel and spaced from each other.

5. A strip array antenna as described in the subject application includes a plurality of conductors, where each of the conductors independently receives MRI signal. Such a strip array antenna is a multiple-element coil array, where element of the array receives linear polarized (*i.e.*, not circular polarized) MRI signal.

6. Foo describes an RF coil that whose structure is that commonly referred to as an RF birdcage coil or simply a birdcage coil. A birdcage coil, such as that shown in Foo, is a single quadrature coil that is made up of a plurality of conductors that are tightly coupled together and which can transmit or receive a circular polarized MRI signal.

7. A birdcage coil also necessarily includes a pair of rings, typically referred to as end rings that are electrically interconnected to each of the axially extending conductors and typically proximal the ends of these conductors so the resultant structure forms or defines a cylindrical volume. The region or object to be imaged is located within this cylindrical volume of the birdcage coil.

8. In Foo, the solid metal shield 11 is mainly for RF shielding to reduce loss and to provide a mirror to modify the magnetic field distribution. The birdcage coil described in Foo forms a closed circuit without such a shield.

9. The ground plane of the present invention, serves as the return path for each of the individual conductors/detector elements so as to form a closed circuit for each of the individual conductors/detector elements.

10. The function of the high dielectric constant dielectric in Foo (see item 13) is to work together with the RF shield to enhance the magnetic field homogeneity in the axial plane in the area identified by reference number 12 in Foo.

11. The function of the material comprising the encapsulation member or the substrate and overlay is completely different from that described in Foo. In the present invention, the material comprising the encapsulation member or the substrate and/or the overlay has the function of adjusting the EMF wavelength; thus thereby in effect adjusting the length of each conductor/detector element. More particularly, the encapsulation member or the substrate and/or the overlay has the function of adjusting the EMF wavelength; thus thereby in effect adjusting the length of each conductor/detector element so as to become the integer number of times of the quarter wavelength.

12. Thus, the birdcage coil disclosed in Foo is completely different in function and structure from the strip array antenna according to the present invention. In sum, Foo does not disclose a strip array antenna according to the present invention.

13. The axial or longitudinal length of a birdcage coil is set so as to be appropriate for the size of the object to be imaged and/ or the specific region within an object to be imaged and not for reducing coupling.

14. The Office Action also asserts that, while Foo does not disclose it, Fujita discloses that the length of each conductor is set so as to substantially reduce coupling of a signal in one of the plurality of conductors to an adjacent conductor(s) independent of the spacing between adjacent conductors. This assertion is incorrect for a number or reasons.

15. Setting aside the fact that Fujita does not expressly disclose this, it cannot be said that this was known to those skilled in the MRI arts at the time Fujita was filed. The conventional wisdom or knowledge of those skilled in the MRI arts at the time Fujita was filed was that the coupling of a signal from one conductor of a strip array antenna or coil to an adjacent conductor(s) of the strip array antenna or coil *was* dependent upon the spacing between the adjacent conductors or coils. As such, it can not be said that one skilled in the MRI arts would have believed that one could set the length of each conductor of a strip array antenna so as to as to substantially reduce coupling of a signal in one conductor to an adjacent conductor(s) *independent* of the spacing between the adjacent conductors.

16. More specifically, it was *not* known to those skilled in the MRI arts at the time Fujita was filed that by setting the length of the conductors of a strip array so as to be equal to about $n\lambda/4$ (where n is an integer ≥ 1 and λ is the wavelength of the signal to be detected), one could substantially reduce the coupling of a signal in one conductor to an adjacent conductor(s), also independent of the spacing between the adjacent conductors.

17. The coil in Fujita is a single quadrature coil which transmit or receives circularly polarized MRI signals. Thus, the comments in paragraphs 5-6 herein also apply to the coil described in Fujita.

18. The Office Action refers to language in Fujita (col. 4, l. 66 – col. 5, l. 2) that the desired image region will determine the spacing and/ or lengths used for the conductors or legs in the Fujita device. This language does not mean that the lengths are set so as to reduce coupling between adjacent conductors; rather this language conveys the well known concept that the spacing and/or lengths is determined based on the region (*e.g.*, size of the region) to be imaged.

19. The device disclosed in Fujita is described as a quadrature highpass ladder surface coil that includes a number of legs that are interconnected to each other by side elements 40,42. This yields a device that is completely different in structure and function from the structure and function of the strip array antenna of the present invention. For example, and as shown in

figures 2-3 of Fujita, the described coil includes an output port 54 that is electrically coupled to a side element 40 for the odd mode and another output port 56 that is electrically coupled to the center leg 34 for the even mode. In addition, the legs and side elements in Fujita cooperate so as to form a plurality of loops, as illustrated by the current paths shown in figure 2 of Fujita. Such a configuration is completely different from the structure and function of a strip array antenna in which each conductor forms an independent detector element of the strip array antenna.

20. The structure of the Fujita surface coil also is such as that it is not possible to independently receive MRI signals in each conductor. Therefore, it cannot be said that Fujita teaches controlling the length of the conductors so as to reduce coupling between adjacent conductors when such conductors are electrically coupled to begin with.

21. The disclosures of the quadrature birdcage coil of Foo and the quadrature surface coil of Fujita both refer to the use of capacitors to tune the respective coils so as to be capable of receiving the MRI signals. There is, however, no other discussion relating to controlling the design of the birdcage coil or the surface coil respectively of Foo and Fujita so as to effect control over the signal being received or transmitted by the respective coil.

22. It appears that the Office Action is referring to the shield 11 shown in figure 1 of Foo, as the basis for asserting that Foo disclose a ground plane. It should be realized that the ground plane of the present invention is not just a shield to prevent loss, but rather serves as a part of the circuit to complete the electromagnetic field path.

I, the undersigned Ray F. Lee, declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

February 2, 2004

Ray F. Lee

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